DEFENCE ACADEMY OF THE UNITED KINGDOM
Cranfield UNIVERSITY
Defence College of Management and Technology

THE VALIDATION OF A THORACIC AND ABDOMINAL TEST RIG FOR BABT SOFT BODY ARMOUR TESTING.

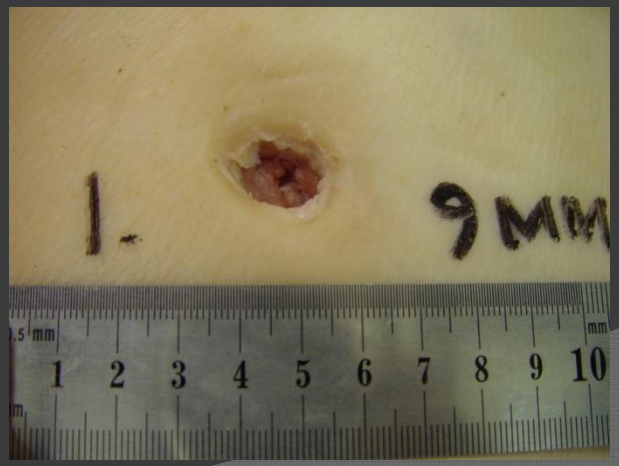
K.Hewins
I.Horsfall
C.Watson
Cranfield University, Shrivenham, UK.
khewins.cu@defenceacademy.mod.uk
+00 (44) 1793 785 330
+00 (44) 7533038677

AIMS

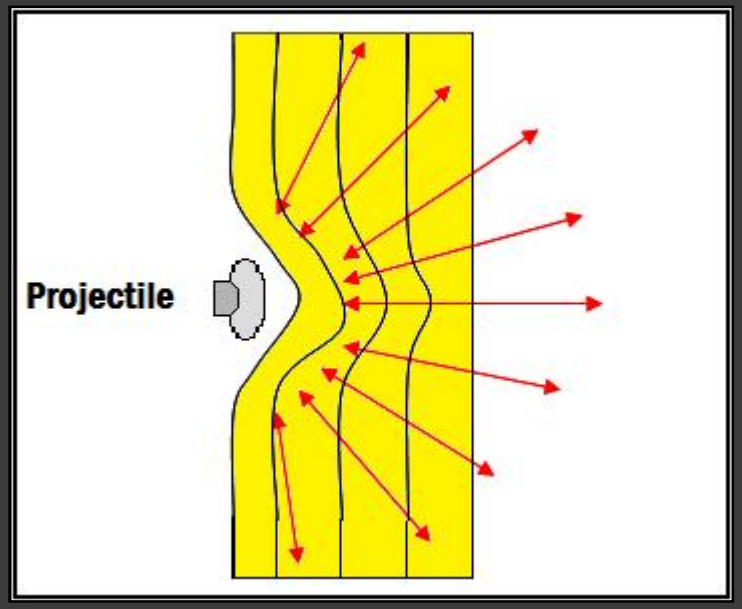
- Define BABT.
- Mechanism of BABT.
- Standards currently in place.
- Problems with current methods.
- The use of a ôTest rigô
- Further Research.

RMOUR BLUNT TRAUMA BABT.

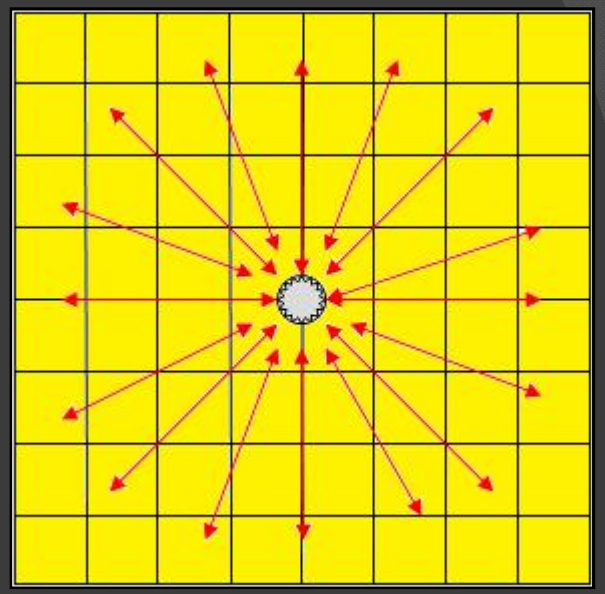
- Law enforcement personal armour.
- High velocity projectile impact.
- Deformation of soft body armour
- Stress waves by initial displacement.
- Shear deformation to viscera.
- Minor and major injuries.



MECHANISM OF BABT.



LATERAL ABSORPTION



RADIAL ABSORPTION

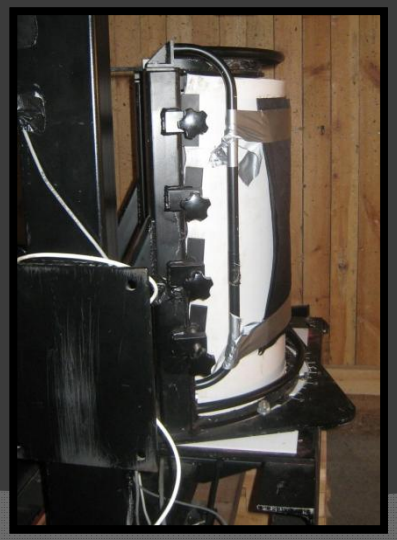
CURRENT STANDARDS

- Uniform level of resistance to BABT
- UK Home Office ï HOSDB
- US Government ï NIJ
- Plastilina ®
- HG1/A level
- 9mm rounds
- 365 +/- 10m/s
- 44mm

PROBLEMS WITH BABT TESTING

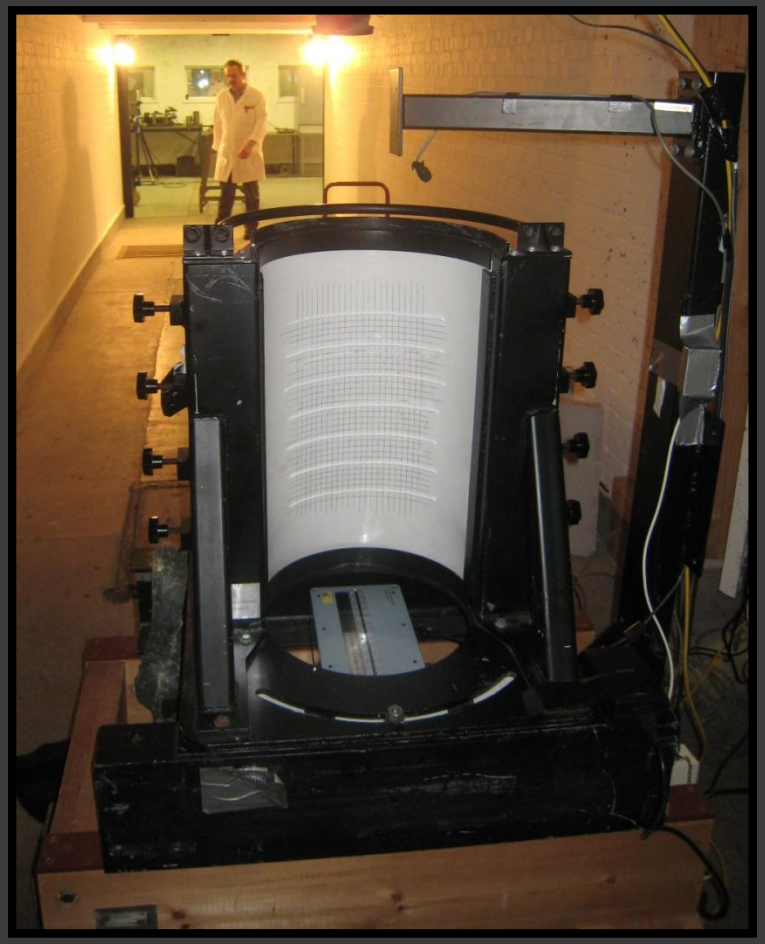
- Biofidelity of Plastilina ®
- Cadaver ï Ethical Issues
- Animal - Ethical Issues
- Hybrid III ï Costly

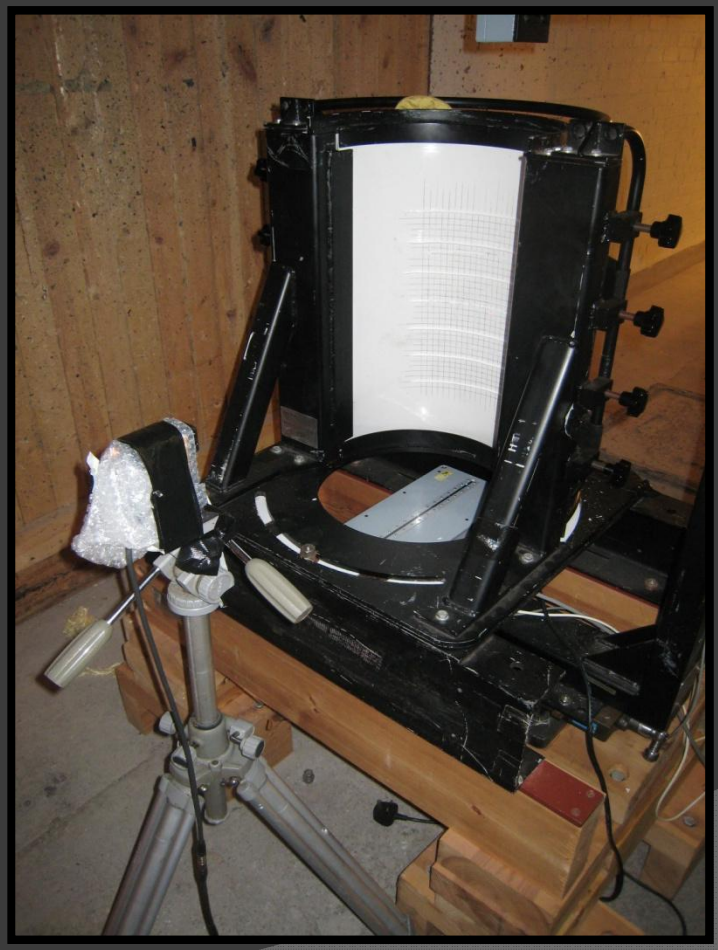
BABT TEST RIG

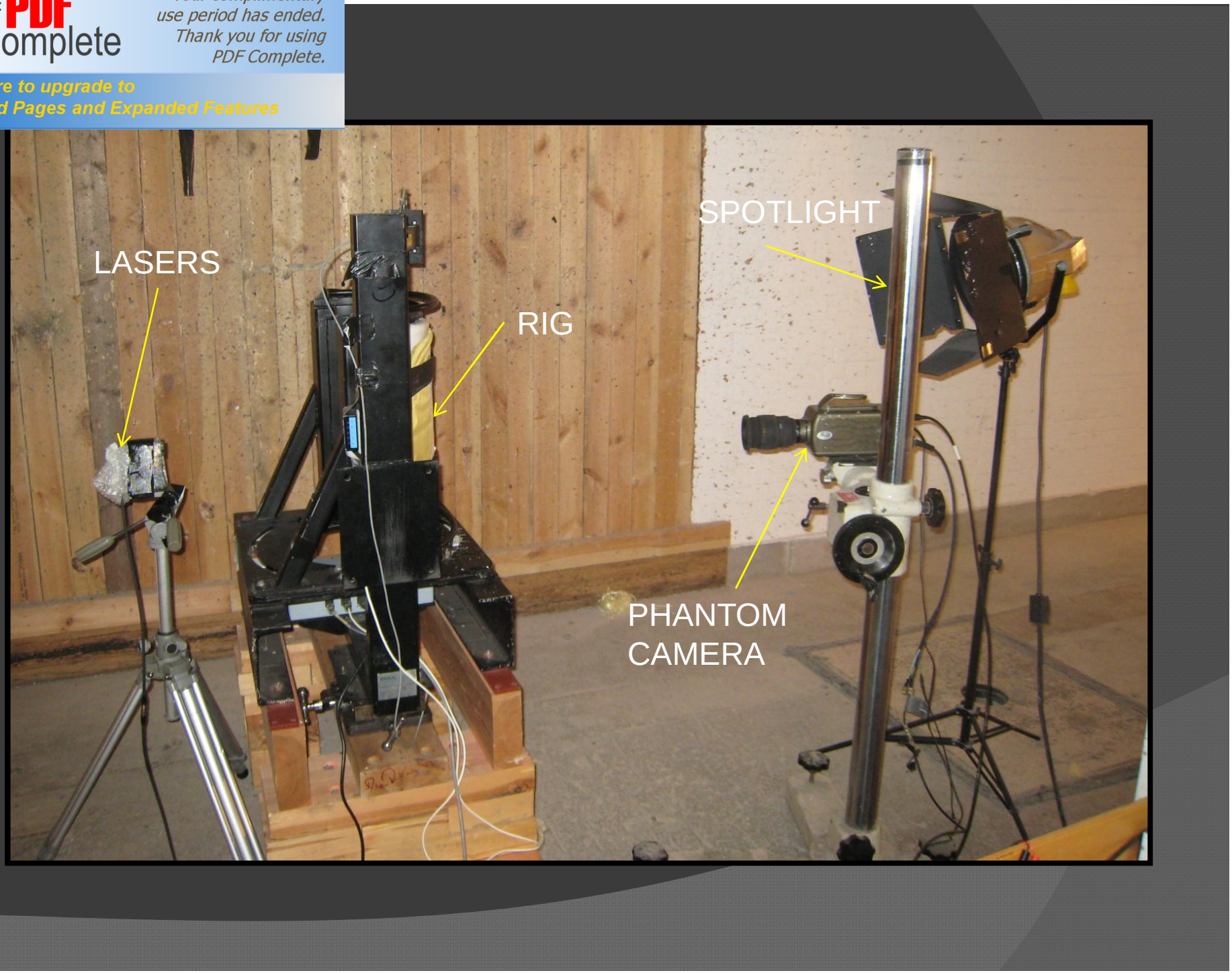


- Three Main Components.
- Response Element
- Lasers
- Framework

DISPLACEMENT LASERS







JURY CRITERIA

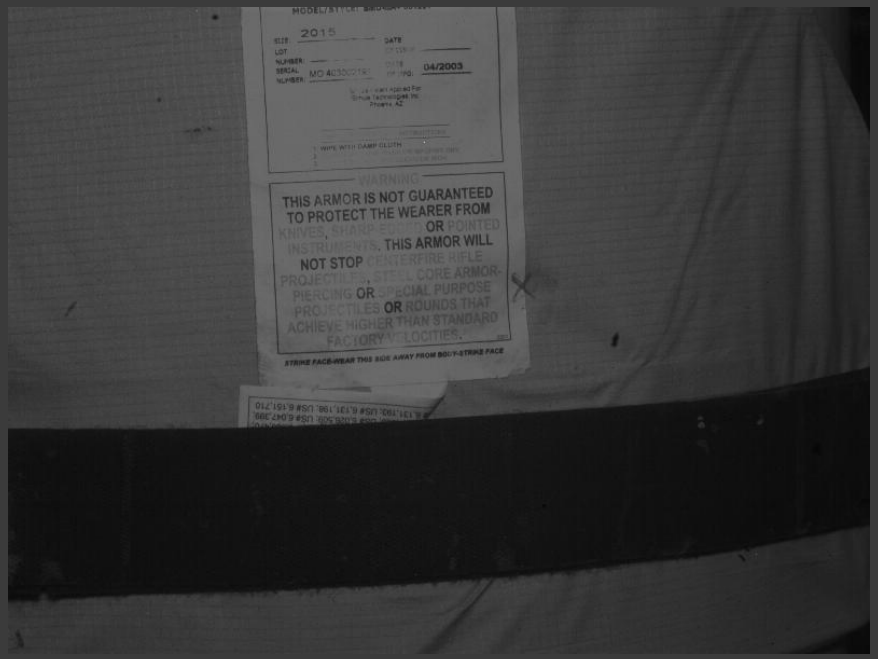
- The Viscous Injury Criterion VC (Lau and Viano 86).
- Severity of Injury.
- Viscous tolerance = risk of soft tissue injury associated with a specific-induced viscous response, VC.
- VC_{max} ï maximum risk.

BALLISTIC TEST PROCEDURE

- HOSDB HG1/A Level
- 9x19mm Nobel Dynamit FMJ DM11A1B2
- 5m Range
- Abdominal and Thoracic

- 30 ply Kevlar ® 49
- 30 ply Teijin Twaron ®
- 30ply Zylon ®

FRONT IMPACT

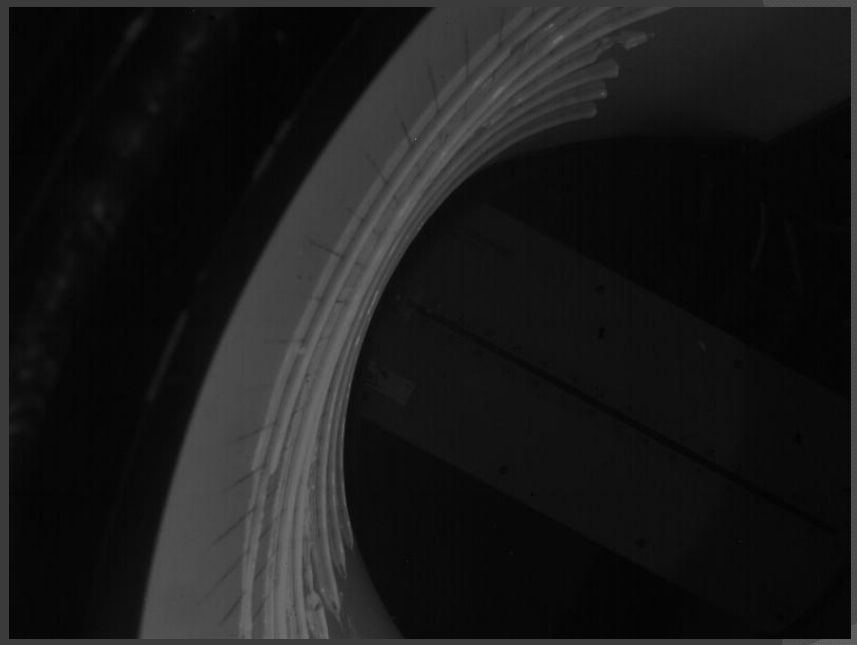


THORACIC SIMULANT

ABDOMINAL SIMULANT

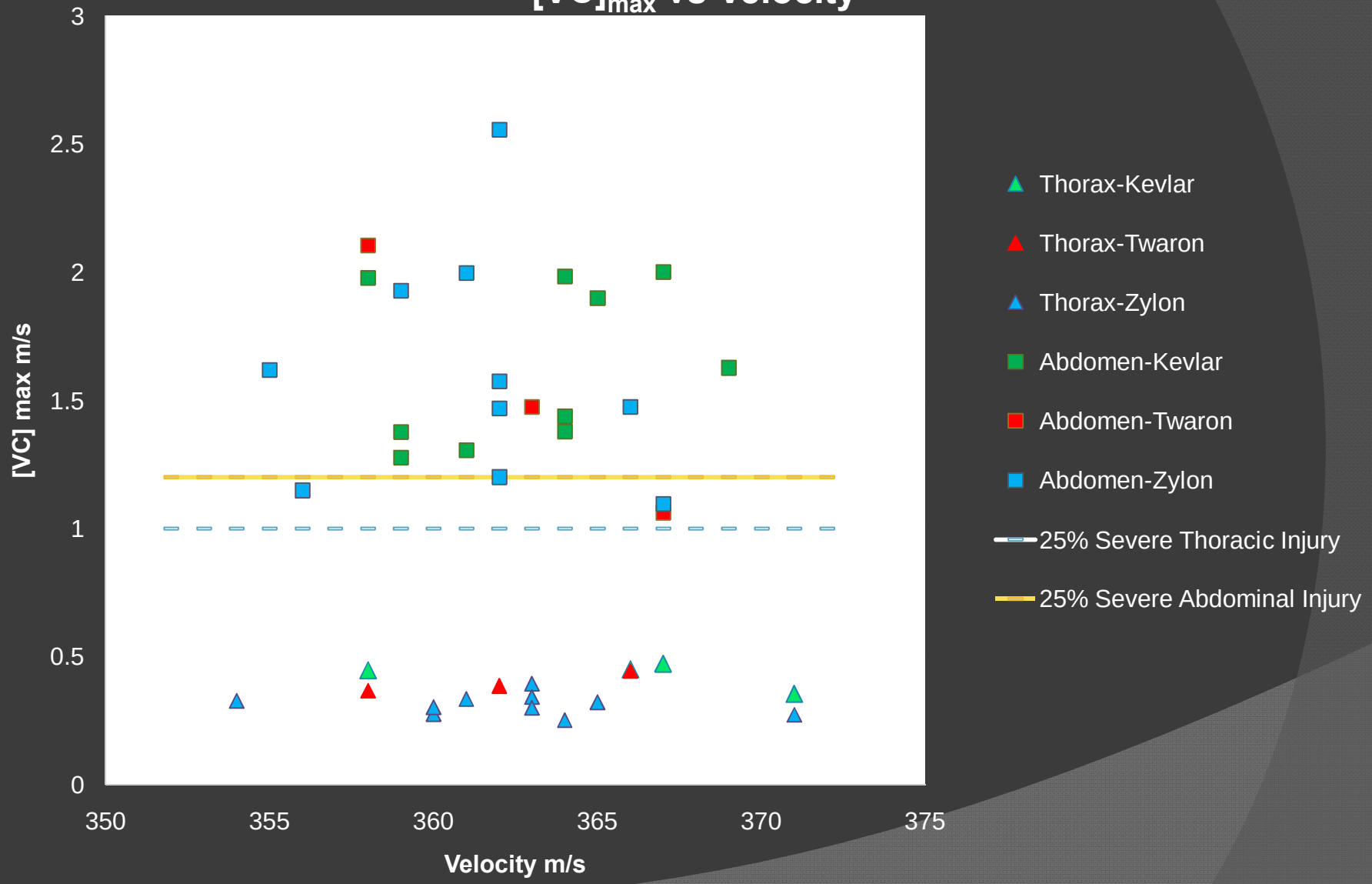
TOP IMPACT

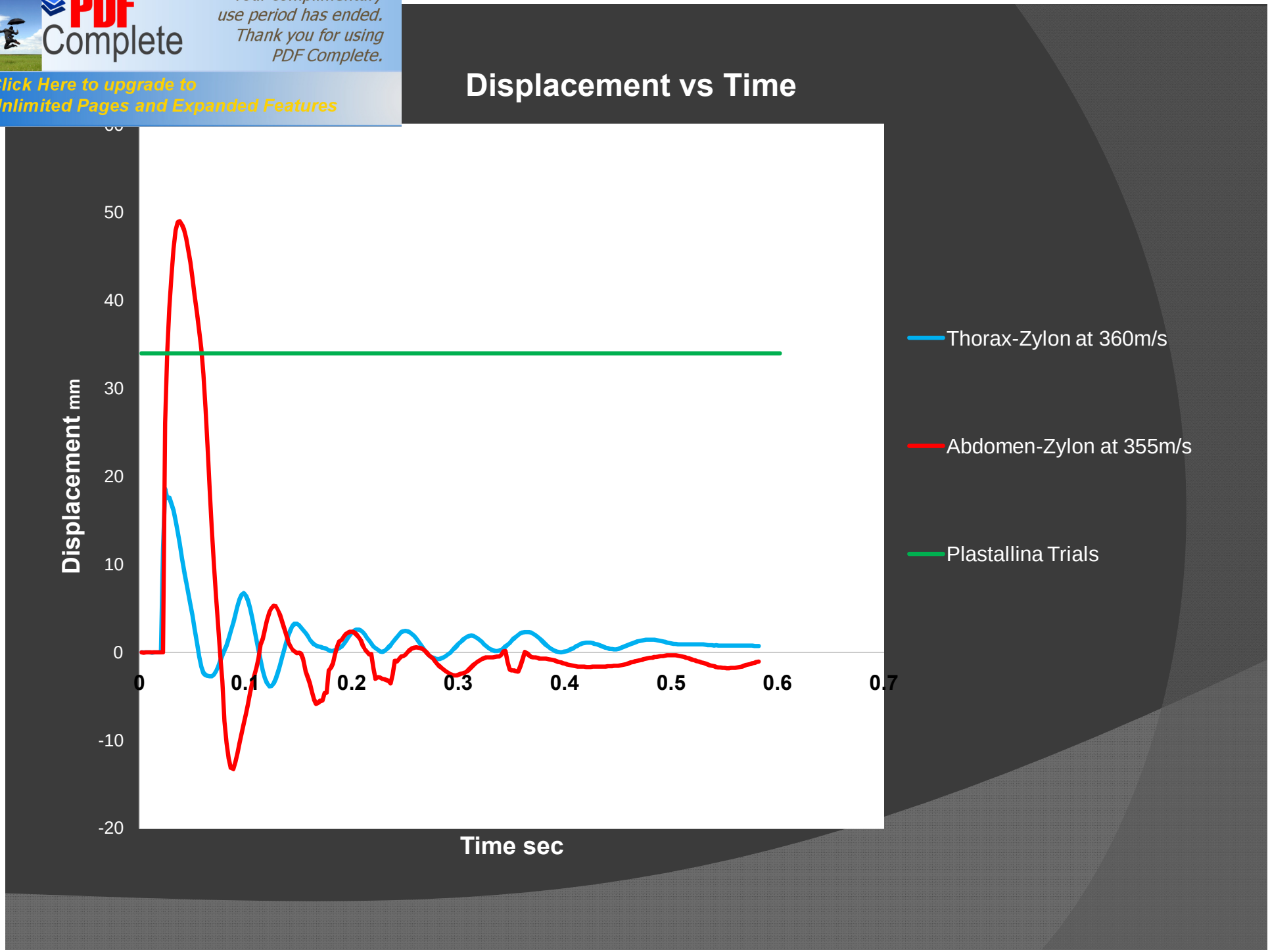
THORACIC SIMULANT



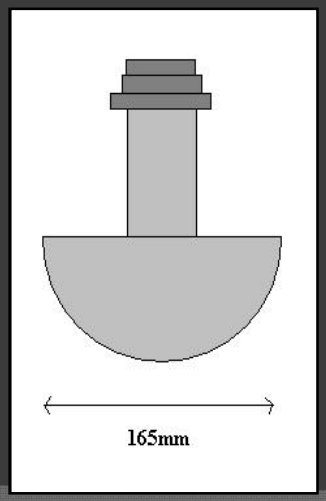
ABDOMINAL SIMULANT

Ballistic Testing. $[VC]_{max}$ vs Velocity

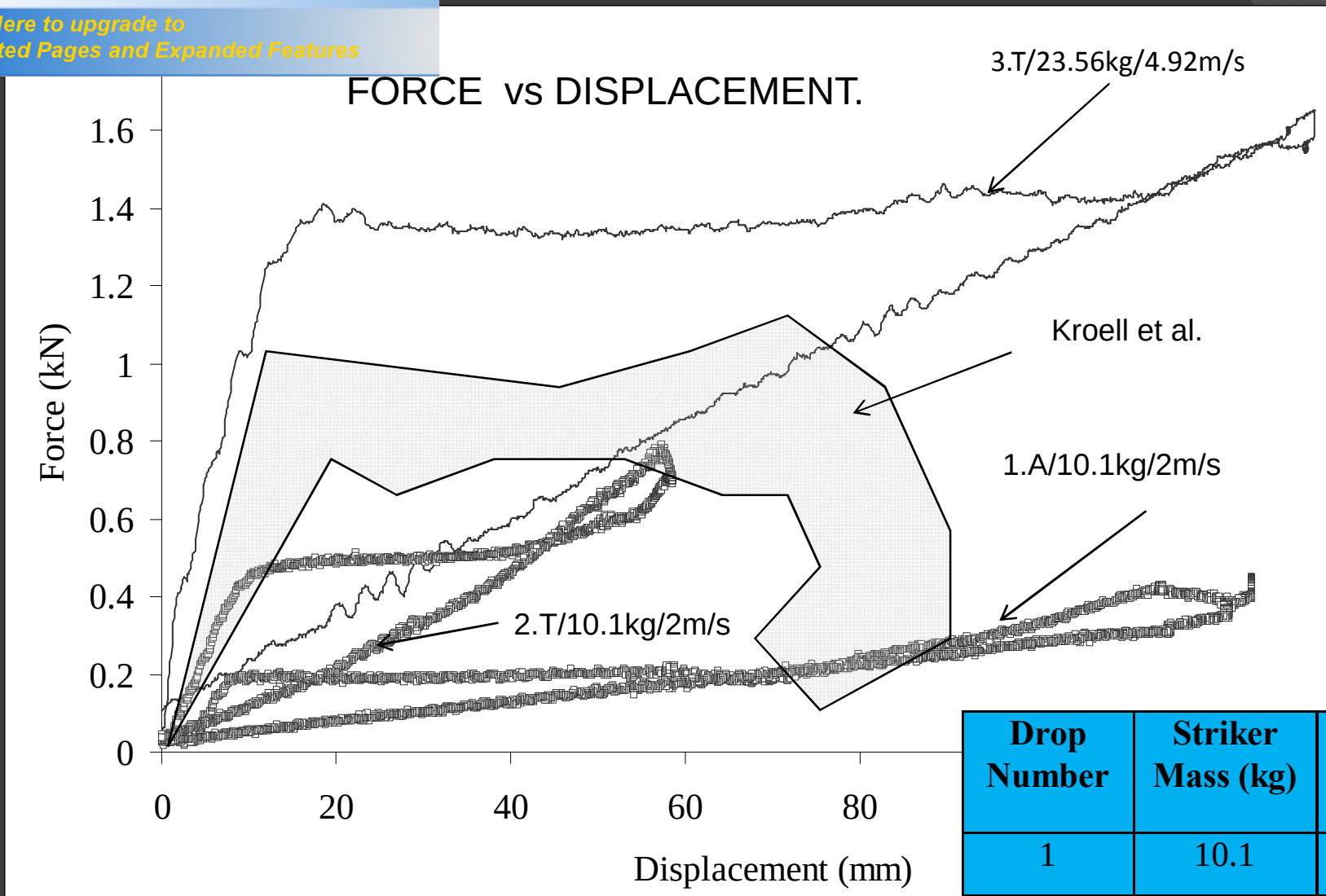




M 10 INSTRUMENTED DROP TOWER



- Displacement/Force/Striker Mass
- Abdomen ï 1.8m/s and 2m/s.
  Striker Mass 10.1kg
- Thorax ï 1.8m/s and 5m/s
  Striker Mass 10.1kg and 23.656kg
- Kroell et al 1974



Drop Number	Striker Mass (kg)	Velocity (m/s)
1	10.1	2
2	10.1	2
3	23.56	4.92
Kroell et al	~23	~4.92

CONCLUSION

- Positive drop tower results.
- Ability to determine Injury severity.
- New abdominal simulant work.

- Further work to determine ideal thickness.
- Advantages over previous techniques.

QUESTIONS?

Thankyou.....

Kate Hewins, Ian Horsfall, Celia Watson.

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